



Физико-технический
институт
ТОМСКИЙ ПОЛИТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

Международная научно-практическая конференция

«Физико-технические проблемы в науке, промышленности и медицине»

Секция 5. Радиационные и пучково-плазменные технологии в науке, технике и медицине

SYNTHESIS OF MONOCRYSTALLINE ULTRADISPERSED ZINC OXIDE POWDER

E.M.Vodopyanov

National Research Tomsk Polytechnic University

Russia, Tomsk, Lenin Avenue, 30, 634050

E-mail: headfire94@gmail.com

There has been a considerable interest in the study of zinc oxide (ZnO) in recent decades. This is a unique functional material with a high electron mobility, a high thermal conductivity, a wide bandgap (3.37 eV) and a large exciton binding energy (60 meV) and the richest family of nanostructures among all materials. Due to its unique properties, zinc oxide is widely used in many industries. Optical and electrical properties are used in solar cells, laser diodes, and gas concentration sensors, varistors, TFTs and others. Antibacterial properties, biocompatibility, and the ability to repel ultraviolet radiation are used in the textile and plastics industry, perfumery, cosmetics, medicine [1,4].

Ultradispersed zinc oxide powder was obtained by the universal plasmodynamic method in discharge of a hyperhigh-speed plasma jet. The jet is generated by a pulse highcurrent (the order of 105 A) coaxial magnetoplasma accelerator (CMPA) of the erosion type [5].

The trunk of the accelerator is an external titanium electrode barrel with zinc disks inside, the diameter of the acceleration channel is 9mm, and the length is 190mm. The basic material (Zinc) is generated by electric erosion of the accelerating canal surface then accelerated plasma jet ejected into the reactor chamber filled with oxygen. The electrical supply to the accelerator was carried out with the help of the capacitive energy storage.

Analytical researches of the received products were done by means of roentgen diffractometry methods. According to the obtained data, the powder is composed of more than 99.9% of the zinc oxide phase that indicates the correct choice of experimental energy parameters and confirms the basic assumption about the possibility of this phase synthesis.

Also the product was analyzed by transmission electron microscopy (TEM) which shows the hexagonal structure of single crystal zinc oxide, and most part of the product consists of 200 nm objects.

Based on the results of this work the following conclusion can be made about the possibility of applying the plasmodynamic synthesis method to obtain an ultradispersed powder of single crystal zinc oxide with a crystal structure - hexagonal system.

REFERENCES

1. Ozgur U., Hofstetter D., Morkoc H. // Proceedings of the IEEE. 2010. T. 98. №. 7. C. 1255-1268.
2. Kuo C. L. // Ceramics International. 2010. T. 36. №. 2. C. 693-698.
3. Renganathan B. // optics & laser technology. 2011. T. 43. №. 8. C. 1398-1404.
4. Beek W. J. E., Wienk M. M., Janssen R. A. J. // Advanced Materials. 2004. T. 16. №. 12. C. 1009-1013.
5. A. A. Sivkov, A. Ya. Pak, and I. A. Rakhmatullin, RF Patent No. 2475449. C01B 21/082, C30B 29/38, C30I 30/00, B82B 3/00, B82U 30/00, C01B 31/02.

TEMPORAL AND SPATIAL DEPENDENCES IN BEHAVIOR OF ATMOSPHERIC RADON, THORON AND THEIR DECAY PRODUCTS

A.G. Kondratjeva, V.S. Yakovleva, N.S. Mishina

Lenina Avenue, 30, 634050, Tomsk, Russia

E-mail: kond_alla@tpu.ru

The processes of transport and removal of radionuclides in surface atmosphere and dwellings atmosphere are very different [1]. On the transfer of atmospheric radionuclides influence humidity, wind, precipitation, cyclones, rough